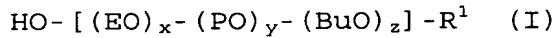


**Claims:**

1. A process for preparing a polymer **P** having amide and ester groups, characterized in that,
  - 5 in a first step, a homo- or copolymer **P1** of (meth)acrylic acid is reacted with a monohydroxylic compound **E** at a temperature of up to 200°C so as to form anhydride groups in addition to ester groups,
  - 10 and, in a second step, the anhydride groups formed in the first step are reacted with a monoamine compound **A** at temperatures significantly below 100°C to give the amide.
- 15 2. The process as claimed in claim 1, characterized in that the first step is effected in the presence of an acid, especially sulfuric acid, p-toluenesulfonic acid, benzenesulfonic acid, methanesulfonic acid, phosphoric acid or phosphorous acid, preferably sulfuric acid.
- 20 3. The process as claimed in claim 1 or 2, characterized in that the monohydroxylic compound **E** is a C6- to C20-alkyl alcohol or has the formula (I)
- 25



30 where x, y and z each independently have the values of 0-250 and x + y + z = 3-250;  
EO = ethyleneoxy, PO = propyleneoxy,  
BuO = butyleneoxy or isobutyleneoxy, with a sequence of the EO, PO, BuO units in any possible sequence;  
35 and R<sup>1</sup> = alkyl group having 1-20 carbon atoms or alkylaryl group having 7-20 carbon atoms.

4. The process as claimed in claim 3, characterized in that  $z = 0$  and  $R^1$  = methyl, ethyl, i-propyl or n-butyl group.

5 5. The process as claimed in claim 3 or 4, characterized in that the monohydroxylic compound **E** is a polyalkylene glycol which is capped at one end and has a molecular weight  $M_w$  of from 300 to 10 000 g/mol, especially from 500 to 5000 g/mol, 10 preferably from 800 to 3000 g/mol.

15 6. The process as claimed in one of claims 1 to 5, characterized in that the homo- or copolymer **P1** of (meth)acrylic acid is prepared by homopolymerization of (meth)acrylic acid or by copolymerization of (meth)acrylic acid with at least one further monomer selected from the group comprising  $\alpha,\beta$ -unsaturated carboxylic acids,  $\alpha,\beta$ -unsaturated carboxylic esters,  $\alpha,\beta$ -unsaturated carboxylates, styrene, ethylene, propylene, vinyl acetate and mixtures thereof.

25 7. The process as claimed in claim 6, characterized in that the further monomer is selected from the group comprising methacrylic acid, acrylic acid, crotonic acid, itaconic acid, maleic acid, fumaric acid, and the salts, esters and mixtures thereof.

30 8. The process as claimed in one of the preceding claims, characterized in that the copolymer **P1** is a copolymer of acrylic acid and methacrylic acid and salts or partial salts thereof; or the homopolymer **P1** is a polymethacrylic acid or polyacrylic acid, preferably a polymethacrylic acid, the salts or partial salts thereof.

35 9. The process as claimed in one of the preceding claims, characterized in that the homo- or

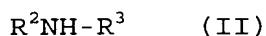
copolymer **P1** of (meth)acrylic acid is prepared by a radical polymerization in the presence of at least one molecular weight regulator, especially of a sulfur compound or of a phosphorus compound.

5

10. The process as claimed in one of the preceding claims, characterized in that the homo- or copolymer **P1** is a homo- or copolymer which is formed from 10 to 250, preferably 20 to 100, in particular 25 to 80, monomer units.

11. The process as claimed in one of the preceding claims, characterized in that the monoamine compound **A** is an amine of the formula (II)

15



where

20  $R^2$  and  $R^3$  together form a ring which optionally comprises oxygen, sulfur or further nitrogen atoms;

25 or where  $R^2$  and  $R^3$  are each independently an alkyl group having from 1 to 12 carbon atoms, a cycloalkyl group having from 5 to 9 carbon atoms, an aralkyl group having from 7 to 12 carbon atoms, a hydroxyalkyl group, especially  $-CH_2CH_2-OH$  or  $-CH_2CH(OH)CH_3$ , a compound of the formula (III), (IV) or (V) or H



30

where  $R^4$  is an alkylene group and  $R^5$  is a  $C_1$ - to  $C_4$ -alkyl group, and X is an S, O or N, and v = 1

when  $X = S$  or  $O$ , or  $v = 2$  when  $X = N$ ; and  $R^6$  is an alkylene group optionally having heteroatoms;

$x$ ,  $y$ ,  $z$  each independently have the values of 0-250 and  $x + y + z = 3-250$ ;

5 EO = ethyleneoxy, PO = propyleneoxy,

BuO = butyleneoxy or isobutyleneoxy, with a sequence of the EO, PO, BuO units in any possible sequence;

10 and  $R^1$  = alkyl group having 1-20 carbon atoms or alkylaryl group having 7-20 carbon atoms.

12. The process as claimed in claim 11, characterized in that compound **A** is selected from the group comprising ammonia, morpholine, 2-morpholin-4-ylethylamine, 2-morpholin-4-ylpropylamine, N,N-dimethylaminopropylamine, ethanolamine, diethanolamine, 2-(2-aminoethoxy)ethanol, dicyclohexylamine, benzylamine, 2-phenylethylamine and mixtures thereof.

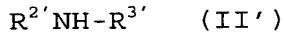
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13. The process as claimed in one of the preceding claims, characterized in that a monoamine compound **A'** is used in the first step in addition to the monohydroxylic compound **E**.

25

14. The process as claimed in claim 13, characterized in that the monoamine compound **A'** is an amine of the formula (II')

30



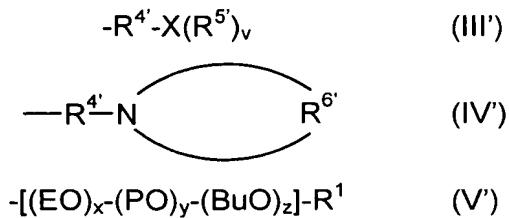
where

$R^{2'}$  and  $R^{3'}$  together form a ring which optionally comprises oxygen, sulfur or further nitrogen atoms;

35

or where  $R^{2'}$  and  $R^{3'}$  are each independently an alkyl group having from 8 to 20 carbon atoms, a cycloalkyl group having from 5 to 9 carbon atoms,

an aralkyl group having from 7 to 12 carbon atoms, a compound of the formula (III'), (IV') or (V') or H



5

where  $R^{4'}$  is an alkylene group and  $R^{5'}$  is a  $C_1$ - to  $C_4$ -alkyl group, and X is an S, O or N, and v = 1 when X = S or O, or v = 2 when X = N; and  $R^{6'}$  is an alkylene group optionally having heteroatoms,

10 x, y, z each independently have the values of 0-250 and  $x + y + z = 3-250$ ;

EO = ethyleneoxy, PO = propyleneoxy,

BuO = butyleneoxy or isobutyleneoxy, with a sequence of the EO, PO, BuO units in any possible sequence;

15 and  $R^1$  = alkyl group having 1-20 carbon atoms or alkylaryl group having 7-20 carbon atoms.

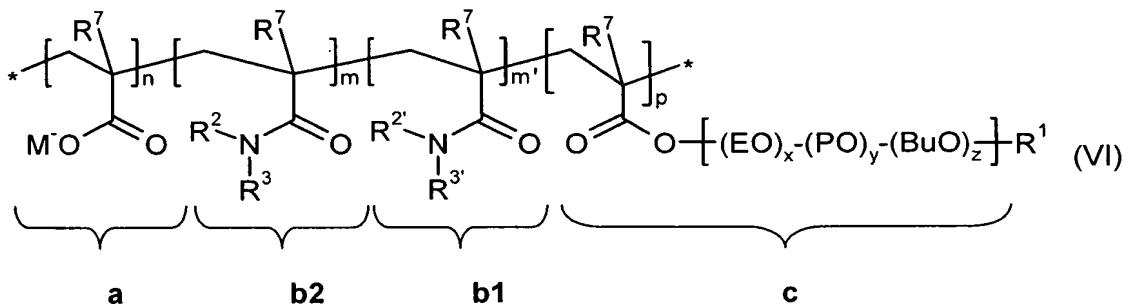
15. The process as claimed in claim 14, characterized 20 in that the substituents  $R^{2'}$  of the formula (V') and  $R^{3'}$  in the compound **A'** of the formula (II') are each H, and the compound **A'** is in particular an  $\alpha$ -methoxy- $\omega$ -amino-oxyethylene-oxypropylene copolymer or an  $\alpha$ -methoxy- $\omega$ -amino-polyoxyethylene, 25 preferably  $\alpha$ -methoxy- $\omega$ -amino-polyoxyethylene.

16. The process as claimed in one of the preceding 30 claims, characterized in that the second step is effected in a solvent, especially in hexane, toluene, xylene, methylcyclohexane, cyclohexane or dioxane, or alcohols or water, preferably water.

17. The process as claimed in one of the preceding claims, characterized in that the temperature of the first step is between 140°C and 200°C, and the temperature of the second step is between 10°C and 5 60°C, preferably between 15°C and 40°C.

18. The process as claimed in one of the preceding claims, characterized in that the polymer **P** having amide and ester groups has the formula (VI)

10



15

where  $M$  = cation, especially  $H^+$ ,  $Na^+$ ,  $Ca^{++}/2$ ,  $Mg^{++}/2$ ,  $NH_4^+$  or an organic ammonium;

$R^7$  are each independently an H or methyl, especially methyl;

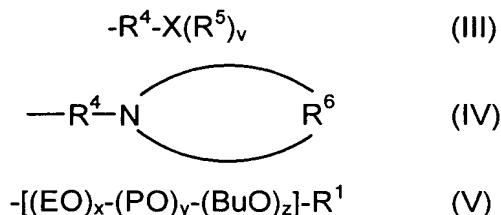
and

20  $R^2$  and  $R^3$  together form a ring which optionally comprises oxygen, sulfur or further nitrogen atoms;

or

25  $R^2$  and  $R^3$  are each independently an alkyl group having from 1 to 12 carbon atoms, a cycloalkyl group having from 5 to 9 carbon atoms, an aralkyl group having from 7 to 12 carbon atoms, a hydroxyalkyl group, especially  $-CH_2CH_2-OH$  or  $-CH_2CH(OH)CH_3$ , a compound of the formula (III), (IV) or (V) or H

30

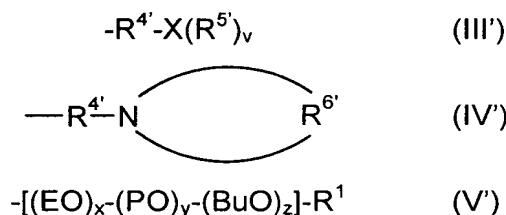


and

R<sup>2</sup>' and R<sup>3</sup>' together form a ring which optionally comprises oxygen, sulfur or further nitrogen atoms;

or

10 12 carbon atoms, a compound of the formula (III'), (IV') or (V')  
or H



and

15  $n + m + m' + p = 10-250$ , preferably 20-100, and  
 $n > 0$ ,  $m > 0$ ,  $p > 0$  and  $m' \geq 0$ ,

and where

$R^4$  and  $R^{4'}$  are each an alkylene group,

$R^5$  and  $R^{5'}$  are each a  $C_1$ - to  $C_4$ -alkyl group,

20 R<sup>6</sup> and R<sup>6'</sup> are each an alkylene group optionally having heteroatoms.

$x$  is an S, Q or N.

$y = 1$  when  $x = S$  or  $Q$ , or  $y = 2$  when  $x = N$ .

$x, y, z$  each independently have the values of 0-250 and  $x + y + z = 3-250$ :

EO = ethyleneoxy, PO = propyleneoxy,  
 BuO = butyleneoxy or isobutyleneoxy with a

sequence of the EO, PO, BuO units in any possible sequence; and

R<sup>1</sup> = alkyl group having 1-20 carbon atoms or alkylaryl group having 7-20 carbon atoms.

5

19. A polymer P having amide and ester groups, characterized in that it is prepared by a process as claimed in one of claims 1 to 18.

10 20. A polymer P having amide and ester groups, characterized in that it is prepared by a process as claimed in claim 18 and in that the ratio of a:b1:b2:c = (0.1-0.9):(0-0.06):(0.001-0.4):(0.099-0.899), and where the sum of a + b1 + b2 + c forms 15 the value 1 and where the ratio of b2/a > 0 and ≤ 1.

21. The use of a polymer P having amide and ester groups as claimed in claim 19 or 20 as a 20 plasticizer for hydraulically setting compositions, especially concrete and mortar.

22. A hydraulically setting composition comprising at least one polymer P having amide and ester groups 25 as claimed in claim 19 or 20.

23. A water-hardened hydraulically setting composition comprising at least one polymer P having amide and ester groups as claimed in claim 19 or 20.

30

24. The use of a polymer P having amide and ester groups as claimed in claim 19 or 20 as a dispersant.